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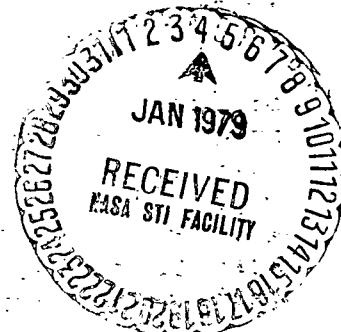
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HIGHLIGHTS OF 1978 ACTIVITIES



Five Pioneer Venus atmospheric entry craft penetrated the clouds of Venus and a companion craft went into orbit around the planet to highlight the 1978 space exploration activities of the National Aeronautics and Space Administration, the agency's 20th anniversary year.

Altogether, NASA conducted 20 launches in 1978, mainly for other organizations or agencies. It was the third year in NASA history with a 100 per cent launch success record. Most of the orbited payloads were for the application and benefit of users on Earth.

The year also was one with major milestones in preparations for the crew-carrying Space Shuttle missions scheduled to start late in 1979.

Space Science

With the Pioneer Venus mission, the United States continued its systematic program of exploration of the solar system and beyond.

Launched on May 20 and August 8, respectively, Pioneer Venus 1 and 2 arrived in the vicinity of Venus in early December to begin the most detailed scientific examination ever conducted of that cloud-shrouded planet. Pioneer Venus 1 was inserted into orbit on Dec. 4 to make measurements and take pictures for at least eight months. The array of instrumented probes which comprised Pioneer Venus 2 arrived on December 9 and began their hour-long descent through the murky Venusian atmosphere at widely separated points. Scientific results from the Pioneers are expected to provide a treasure of information about Venus and its weather on a global scale--information that may help scientists learn more about the forces that drive the weather on Earth.

The Pioneer Venus mission was a prelude to the coming "Year of the Planets." In 1979, two spacecraft will encounter Jupiter and another spacecraft will fly past the rings of Saturn. Voyager 1 is scheduled to make its closest approach to the giant Jupiter on March 5, 1979. On July 9, 1979, Voyager 2 also will fly by, taking the best closeup photos to date of both Jupiter and a number of its moons. Both spacecraft will head on to Saturn, some 600 million kilometers (400 million miles) further away, arriving there on Nov. 12, 1980 and Aug. 27, 1981, respectively. The Saturn encounter will be the first by a spacecraft. At the time of closest encounter, the Voyagers will have traveled more than 2.4 billion km (1.5 billion mi.) through space. If all goes well, Voyager 2 will reach the even more distant Uranus and, possibly, Neptune.

Besides the planets, NASA continued to launch unmanned Earth-orbiting spacecraft which focus on some of the most intriguing mysteries of the universe -- pulsars, quasars, exploding galaxies and black holes in space -- objects unknown to scientists before the space program. The flawless launch of an Atlas Centaur rocket Nov. 13, 1978, sent aloft High Energy Astronomy Observatory (HEAO) 2 -- the second in a series of three large observatories designed to study the "high-energy universe"--the world of X-rays, gamma rays and cosmic rays.

These cannot be studied from the ground because of the obscuring effects of the Earth's atmosphere. HEAO 1 was launched in 1977 to conduct a general X-ray survey. HEAO 2 is designed to study for long periods of time those areas of the sky identified by HEAO 1 as "interesting." HEAO 3 will be launched in 1979 to collect gamma ray and cosmic ray data. The X-ray images returned by HEAO 2 in November were the first spacecraft-generated images of wide objects other than the Sun.

In November 1978, a satellite called International Sun-Earth Explorer 3 (ISEE 3), launched in August, was moved into a giant "halo orbit" above Earth. ISEE 1 and 2, launched in October 1977, are in elliptical Earth orbits that travel through the magnetosphere. ISEE 3's special orbit, the most unusual ever proposed for a NASA space mission, is around the L-1 "Libration Point" located between the Earth and the Sun about 1.5 million km (1 million mi.) from the Earth. The L-1 libration point is one of several such points in the Earth's neighborhood where the gravitational pull of the Sun is balanced by that of the Earth-Moon system.

From its vantage point, ISEE 3 will measure the solar wind constantly emitted by the Sun, and other solar phenomena such as sunspots and solar flares, while ISEE 1 and 2 measure the effect of the same phenomena in the near-Earth environment. ISEE 3 will monitor the characteristics of the solar phenomena about an hour before the two Earth-orbiting ISEE spacecraft. The correlated measurements will tell scientists a lot about the Sun and how it changes with time and distance. All three spacecraft will be closely observing such phenomena during the period of maximum solar activity for the new 11-year solar cycle which began in June 1976.

Also launched in 1978 was the first International Ultraviolet Explorer (IUE), a telescope in space which can be operated effectively in real time by astronomers on the ground. Visiting astronomers at NASA's Goddard Space Flight Center in Greenbelt, Md., can have the ultraviolet telescope pointed, decide what data to take, and modify their measurements as they observe.

Space Transportation Systems

For the Space Shuttle, 1978 was a year of testing, training, and construction. Fabrication of the second Shuttle orbiter advanced, major Shuttle elements were tested, a new group of astronaut candidates was selected and the crew for the first orbital flight test was named.

In March 1978, the first Space Shuttle orbiter, the Enterprise, was shipped to the Marshall Space Flight Center, Huntsville, Ala. There, for the first time, all elements of the Shuttle (orbiter, two solid rocket boosters, and external fuel tank) were mated for ground vibration tests which will be completed early next year.

Considerable manufacturing was completed on Shuttle orbiter 102, the second orbiter and the first to go into space, at the Palmdale, Calif. facility of Rockwell International. Orbiter 102 will be delivered to the Kennedy Space Center, Fla., early next year.

Testing of the Space Shuttle main engine picked up pace in 1978. A total of over 35,000 seconds of main engine test time was accumulated and the three engine configuration was test fired four times successfully. A highlight of the test series was the long duration burn of a single engine conducted in November. The engine operated continuously for 823 seconds to test its capability to return the Shuttle orbiter to a landing site in the event of the loss of one engine during launch.

In October, a third solid rocket motor was successfully test fired. The solid rocket booster parachute test program was completed in 1978. The rocket casings are to be recovered by parachute after each launch.

In the Shuttle launch and landing area at the Kennedy Space Center, all facilities, ground support equipment, and the launch processing system are being activated as required to support the first test flight.

Four two-men crews were selected in March to begin training for orbital test flights of the Space Shuttle. Astronauts John Young and Robert L. Crippen were named as the prime crew for the first orbital flight. Joe H. Engle and Richard H. Truly will be the backup crew for that flight.

Other crews named for the test flight were Fred W. Haise and Jack R. Lousma; Vance D. Brand and C. Gordon Fullerton.

Anticipating the Shuttle's flight schedule in the years ahead, NASA selected 35 new astronaut candidates in January to begin training as pilots and mission specialists. The 35, including six women, reported to the Johnson Space Center, Houston, in July and will be in training until mid-1980.

The European Space Agency (ESA) continued to make substantial progress in the development of Spacelab, the habitable module and payload pallets that will fit into the Space Shuttle cargo bay. The Spacelab engineering model is scheduled to be delivered to NASA in the latter part of 1979. Manufacturing of the initial flight module unit is complete and initial assembly has begun. The first Spacelab pallet was delivered to KSC in December.

During the year, attention was focused on the Skylab space station as its orbital altitude decreased more rapidly than expected due to unusually high sunspot activity. In June, the power and control systems on board Skylab were successfully reactivated and it was reoriented to a low drag attitude. Some problems were encountered in late June and July; however, Skylab has been stable since July 25. NASA announced late in December that it is discontinuing planning efforts to reboost or deorbit the space station because of the limited potential for success.

Space Transportation Systems operations planning continued at a steady pace. In the area of user development, launch service agreements are being prepared for nine users that have made advance payments for 35 commercial payloads to be flown on the Space Shuttle. Also, the small self-contained payload program (Getaway Specials) continues to attract new users for the Shuttle. By December, over 160 users had submitted down payments to fly about 270 payloads.

Emphasis in the advanced program area during the past year centered on investigating concepts that could improve the utility, flexibility and effectiveness of the Space Transportation System. Major efforts were devoted to studying systems that would enhance the Space Shuttle's power, energy and duration in orbit. Also ways to augment the launch thrust of the Shuttle were studied.

Other studies concentrated on concepts for fabrication and assembly of space structures including geosynchronous platforms as well as concepts for providing future satellite services such as placement, retrieval, and on-orbit maintenance and repair.

Space and Terrestrial Applications

After more than five and one-half years during which it orbited the Earth 28,854 times at 870 kilometers (540 miles) and sent back 271,786 multi-spectral images, Landsat-1, NASA's first Earth resources monitoring satellite, was turned off March 23, 1978. On March 5, a more advanced Landsat-3 had been launched into a near polar orbit from the Western Test Range (WTR), Vandenberg Air Force Base, Calif. In addition to the multi-spectral scanner carried by Landsats-1 and -2, Landsat-3 also carried a two-camera panchromatic return-beam vidicon system, which to date has transmitted 12,000 scenes with a resolution better than 40 meters (130 feet).

In December, a contract was awarded to the General Electric Space Division, Philadelphia, Pa., for a still advanced Earth resources monitoring satellite, Landsat-D, to be launched in the fall of 1981.

An example of NASA's Landsat Application Systems Verification and Transfer (ASVT) program is an agreement with the Appalachian Regional Commission to test and evaluate the use of Landsat data for the identification of high-potential gas shale exploration areas. The area to be explored extends from the Mississippi Basin to the Appalachian Mountains. Another ASVT program was started with the Pacific Northwest Regional Commission to use Landsat data for natural resource management in Washington, Idaho and Oregon.

The ASVT program is a continuing effort by NASA to make space technology accessible to state and local governments, private industry and universities.

A major Landsat experiment completed in 1978 was the LACIE (Large Area Crop Inventory Experiment) program. The experiment, begun in 1974, proved that Landsat data, coupled with surface observations and information from U.S. operational environmental satellites could forecast wheat production on a global basis.

In monitoring the Soviet wheat crop harvested in 1977, the LACIE estimate of 91.4 million metric tons was less than one percent below the official 92.0 million tons reported by the Soviets.

Environment

The Environmental Observation Division of NASA had four major satellite launches during the year:

- Applications Explorer Mission (AEM), or Heat Capacity Mapping Mission (HCCM), launched from Vandenberg on April 25, a satellite designed to measure day and night temperature differences on the Earth's surface.

- Seasat, launched from Vandenberg June 24, designed to study the Earth's oceans. Seasat returned data for 106 days before a massive short circuit ended data transmission October 10. Although a short-lived mission, Seasat sent back valuable data on ocean surface winds, currents, wave heights and ocean topography, and in doing so proved the feasibility of this type of mission.

- TIROS-N, a NASA-designed, third generation weather satellite, which was turned over to the National Oceanographic and Atmospheric Administration as an operational satellite on November 30.

- Nimbus-G, the first pollution monitoring satellite. New instruments on this spacecraft are designed to detect Earth and solar radiation parameters, total ozone amounts, sea ice concentration, sea surface temperatures, wind speed, atmospheric water vapor, rain rates and stratospheric temperature profiles.

1978 was also the year of tracking moving targets on Earth from the Nimbus-6 satellite--the first balloonists to cross the Atlantic Ocean (Eagle II), a Japanese explorer and his dog sled over the North Pole, and an experiment in Egypt aimed at learning more about the laws of sand movement for possible application in saving fertile areas from the ever-encroaching deserts.

A technique for measuring the height of cloud tops using simultaneous daytime observations from two GOES satellites has been developed. This will provide estimates of cloud top height to an accuracy of better than 500 meters (1640 feet), which far exceeds what is currently available.

The application of this technique can lead to improved weather prediction models and can be used to estimate the heights of thunderstorms.

Several studies were completed this year which will provide improved knowledge of how to construct various types of climate models. Data from a Nimbus infrared sensor has been used to improve understanding of the gross structure of the boundary layer of the atmosphere over oceans. This will help in developing and validating seasonal climate prediction models.

Technology Utilization

NASA's Technology Utilization Program continued as the agency's focal point for the transfer of aerospace technology into other sectors of the national economy.

The following statistical highlights for 1978 give an insight into the scope of this increasingly important effort:

- A broad-based program of 70 applications engineering projects was continued in the on-going effort to apply aerospace technology and know-how to solve public sector problems ranging from development of advanced medical instruments to fire-fighting devices. Seven industrial applications centers, two state technology applications centers and the Computer Software Management and Information Center (COSMIC) continue to expand their services to industry and state and local governments, having served over 13,000 users in 1978. Income from services was \$2.2 million dollars, an increase of 28 per cent over the previous year.
- The Tech Brief Journal reported 725 new NASA innovations, products and processes and was distributed quarterly to 50,000 requestors.

In August, the four-member family of Dr. Charles W. Swain, a professor at Florida State University in Tallahassee, ended its year-long experiment of living in the NASA Langley Research Center's "Tech House," a conventional house equipped with unconventional space-age technical systems designed to save money and energy.

Preliminary results show that:

- Energy was less than half of that used in a conventional, all-electric home.
- Total dollar savings from reductions in energy and water use amounted to more than \$1200.

At the Marshall Space Flight Center, Frank J. Nola, a space flight engineer invented an inexpensive, yet revolutionary device he calls a Power Factor Controller, or "Motor Mizer." The small device can continuously determine the precise amount of electricity a household or industrial motor needs to perform efficiently. It does this by sensing changes in voltage and current as the workload increases or decreases.

Tests conducted on over 30 motors indicate the savings will range up to 60 per cent, depending on the workload. Since a reported 64 per cent of all electricity generated in the United States goes to operate electric motors, the "Motor Mizer's" potential for achieving energy savings is obviously enormous.

At the Lewis Research Center, Cleveland, Ohio, a new device to reduce and regulate pressure inside the eye during glaucoma surgery was developed by Cleveland ophthalmologist Dr. William J. McGannon and Dr. Dong H. Shin of the Kresge Eye Institute, Wayne State University, Detroit, Mich. The device is based on fluid systems and components Technology developed by NASA. Dr. McGannon also worked on the development of a new surgical instrument for the removal of hard eye cataracts. NASA and the National Eye Institute, Bethesda, Md., have signed a cooperative agreement to conduct laboratory and clinical tests on the device.

Aeronautics

Research and technology developments, during the past year, reached several major milestones towards achieving quieter, safer, more energy-efficient aircraft.

The NASA Quiet Short-haul Research Aircraft (QSRA) began its flight program, demonstrating new technology enabling truly quiet operation of jet aircraft. When scaled-up to the equivalent of a currently operational 150-passenger jet transport, the QSRA would make one-thirtieth the noise and land at about half the speed.

A future QSRA-derivative aircraft could operate from small airports with runways as short as 460 to 900 meters (1,500 to 3,000 feet) compared with today's requirements for runways of 1.6 kilometers (1 mile) or more and could operate so quietly that no noise could be heard in the surrounding community.

Potential major reductions in noise and air pollution are also being demonstrated by NASA's quiet clean, short-haul experimental engine (QCSEE) program. Initial test results show the QCSEE engines run 8 to 12 decibels below FAA requirements due to take effect in the 1980's.

NASA's aircraft energy efficiency program focuses on reducing fuel consumption in civil transport aircraft. Propulsion research, improved aerodynamics, lighter weight structures and computerized flight control systems are being studied. Collectively, these technology developments could cut fuel consumption up to 50 per cent in future generation aircraft.

Vertical takeoff and landing aircraft research and technology development efforts are aimed at improving performance and quieter operations. The NASA/Army Tilt Rotor Research Aircraft and Rotor Systems Research Aircraft both moved into flight research phase this year.

Two Highly Maneuverable Aircraft Technology remotely piloted research vehicles were built and delivered to NASA in preparation for flight research to begin in the spring of 1979. Studies and research for high-speed flight, leading to technology development for future civil and military aircraft, also yielded promising results during 1978.

General aviation aircraft studies, tests and technology advancements this year promise improved safety and utility of this class aircraft in the future.

Space Research and Technology

Space research and development provides advanced technology for future space missions. These technology-development programs address requirements for advanced information systems; spacecraft, power and transportation systems; and Shuttle technology payloads.

Emphasis of the information systems program is to develop technology to increase the efficiency and reduce the cost of data acquisition, reduction and dissemination. Significant progress was achieved in technology development for a solid-state imaging camera, annular suspension pointing system, synthetic aperture radar data processor and the spherical array antenna.

The spacecraft systems program work included new concepts in deployable structures, continued efforts in erectable structures, automated assembly operations and navigation techniques, chemical and electrical propulsion and advanced entry technology.

Power systems technology development continued in support of future Shuttle-based needs in near-Earth space operations and for systems to support electric propulsion.

In space transportation systems Earth-to-orbit and return research, emphasis was focused on technologies to reduce operational costs. Increased versatility, including high-thrust reusable systems and high-performance low-thrust systems, was the focus in orbital-transfer vehicle technology development.

The Shuttle technology payload program is designed to extend research and technology into space. More than 20 experiments were selected this year. The program consists of four major elements: Orbiter Experiments; Long Duration Exposure Facility experiments, Spacelab payloads and free-flying payloads.

The development of the Long Duration Exposure Facility neared completion and development of the 48 candidate experiments is well underway.

Energy Programs

NASA's goal is to assure the effective use of its experience and technologies in support of national energy needs.

Sponsored by the Department of Energy (DOE), this NASA work encompasses a variety of tasks including satellite power systems, nuclear waste management in space, industrial gas turbine development, solar heating and cooling, wind turbine generators, solar thermal electric conversion, energy storage and advanced coal extraction.

Other efforts include photovoltaics, automotive power systems, fuel cell and hydrogen systems, magnetohydrodynamics and combustion, materials and heat-exchanger technology.

In the past year, major strides were made in maturing the technology for large wind-driven turbines and NASA has recommended to the DOE that work toward commercialization should begin.

Solar heating and cooling hardware development work, initiated in 1976, is now in its final phase. A number of improved heating systems were installed in operational test buildings in 1978. Additionally, many demonstration projects are now operating and producing data in the Commercial Demonstration Program.

NASA's photovoltaics project continued to make excellent progress toward achievement of DOE solar cell cost and performance goals. Cell cost is steadily being reduced, and NASA believes that the ultimate objective of \$0.50 per peak watt is achievable.

NASA has continued providing technical assistance in the development of an upgraded automotive fan turbine engine.

International

In 1978, NASA's international activity highlights included: successful launching of three spacecraft in projects involving major foreign contributions--TIROS-N, International Ultraviolet Explorer (IUE) and International Sun Earth Explorer (ISEE-3); conclusion of agreements with the European Space Agency (ESA), Canada and India for the direct reception of data from NASA applications satellites; steady progress in Spacelab and Remote Manipulator System development programs abroad; selection of Payload Specialists for the first Spacelab mission; seven international reimbursable launches; completion of the Joint American Soviet Particle Intercalibration (JASPIC) Project; establishment of a space science and application study program with Japan; and discussions with the People's Republic of China regarding the possible sale by U.S. industry and launch by NASA of the domestic communications satellite.

The sensors of TIROS-N, launched on Oct. 13 for the National Oceanic and Atmospheric Administration (NOAA) are multi-national in character. Each operational spacecraft in the series will carry a stratospheric sounding unit developed and funded by Great Britain and a data collect and platform location system developed, funded and operated by the French Space Agency, CNES.

NASA launched IUE, a cooperative project with ESA and the British Science Research Council (SRC), on Jan. 26. IUE is studying celestial objects that emit ultraviolet radiations not detectable from the ground. ESA contributed the solar array and the Madrid ground facilities. SRC, in collaboration with the University College, London, provided the four television camera detectors for transforming the spectral displays into video signals for transmission to the ground.

The objective of ISEE-3, launched Aug. 12, in a cooperative NASA/ESA project, is to gain a better understanding of how the Sun controls the Earth's near space environment. The three-spacecraft project involves 117 scientific investigators representing 35 universities in 10 nations. NASA is responsible for ISEE 1 and 3, the Delta launch vehicles, tracking and data acquisition and data processing. ESA is responsible for the ISEE 2 spacecraft and its operation.

ESA continues to make substantial progress in the development of the Spacelab that will be carried to and from orbit in the Space Shuttle orbiter. Integration and testing of the engineering model is well underway and it is scheduled to be delivered to NASA in August 1979.

The Critical Design Review of the Remote Manipulator System for the Shuttle Orbiter being contributed by Canada was successfully completed in April 1978. Delivery of the first unit is scheduled for September 1979.

During 1978, several new agreements were included for the direct reception of data from NASA application satellites at stations funded and built by foreign agencies.

NASA and ESA signed three memoranda of understanding in Paris on Oct. 7 concerning the acquisition by European ground stations, pre-processing and distribution of data from the Landsat series of satellites and several ESA-coordinated investigations involving data received in Europe from NASA's Nimbus-7 and Seasat satellites.

NASA and Canada's Department of Energy Mines and Resources (EMR) signed an agreement Sept. 19 to carry out a scientific investigations program using Seasat data received directly at a ground station established by Canada at Shoe Cove, Newfoundland. However, in October, the Seasat ceased to function due to an electrical problem.

The Indian National Remote Sensing Agency signed an agreement with the U.S. in January 1978 under which it will build a Landsat ground station which will receive, process, and disseminate Earth resources data of South Asia.

Similar stations are in operation in Canada, Brazil, Italy and Sweden. A station in Iran is expected to begin regular operations shortly. Stations are under development in Japan, India, Argentina and Australia and stations have been proposed for Upper Volta, New Zealand, Kenya, Thailand, Romania, Chile and Zaire.

In 1978, NASA successfully launched seven international satellites for which the U.S. was reimbursed.

- The International Telecommunications Satellite Consortium (INTELSAT) IV-A program represents an investment by 101 nations of nearly \$296 million (U.S.) in a worldwide communications satellite network. NASA successfully launched Intelsat IV-A F-3 on Jan. 6, and Intelsat IV-A F-6 on March 31. The satellites both operated in geostationary orbit over the Indian Ocean to provide communication services to over 40 countries in that region.

- On April 7, NASA launched the medium-scale Broadcasting Satellite for Experimental Purposes (BSE), for Japan's National Space Development Agency (NASDA). BSE is testing new methods of transmitting high quality color television economically to the Japanese islands and Okinawa through the use of small, low-cost ground receivers.

- Orbital Test Satellite-2 (OTS-B) was launched May 11 for ESA. This is one of two experimental models under study by ESA for use as the foundation of a fully operational European regional communications satellite system.

- On July 14, NASA launched the second Geostationary Scientific Satellite (GEOS-2) for ESA. The primary mission of GEOS-2 is to study the Earth's magnetosphere. GEOS-2 will continue seven experiments begun by GEOS-1.

- NATO III-C, the third and final communications satellite in a new series to serve the North American Treaty Organization (NATO), was launched on Nov. 15.

- Canada's most advanced domestic communications satellite (ANIK-B), launched on Dec. 15, is the fourth domestic communications satellite launched by NASA for Telesat Canada which owns and operates the satellites as the country's Domestic Communications Satellite System. This is a second generation satellite in a series often called Telesat and ANIK-B is referred to as Telesat-D by NASA.

NASA selected two American Payload Specialists and ESA selected three European Payload Specialists for the first Spacelab mission. Dr. Michael L. Lampton and Byron K. Lichtenberg were selected as the U.S. Payload Specialists. ESA selected Dr. Ulf Merbold (German), Dr. Claude Nicollier (Swiss) and Dr. Wubbo Ockels (Dutch).

One American and one European eventually will be selected to fly aboard the Earth-orbiting space laboratory and operate the science instruments.

A meeting of the U.S./U.S.S.R. Working Group on Near-Earth Space, the Moon and the Planets was held at Innsbruck, Austria June 7-9 to discuss Venus 1978 missions, possible Venus 1983-4 missions, and important future lunar and planetary science objectives. The U.S. and U.S.S.R. agreed to exchange data obtained from the exploration of Venus in connection with the 1978 missions to enhance the scientific value of the respective missions.

Objective of the JASPIC project concluded in September to compare the techniques used by the United States and Russia over the years to deduce the intensity of energetic electrons and protons coming down into the lower ionosphere. The project is designed to gather experimental evidence concerning the role of these particles in creating ionization in the lower ionosphere at night at midlatitudes. Eight rocketborne experiments were conducted jointly during June from NASA's Wallops Island location and the Soviet research ship, Professor Vize, located off Virginia's Eastern shore. The final rocket, a Nike-Apache, was launched Sept. 27.

NASA and Japan's Space Activities Commission have established a joint study program to assess possible cooperative space science and applications projects of mutual interest. The first meeting of the study group was held in Tokyo Dec. 12-15.

NASA hosted a visit of a space delegation from the People's Republic of China (PRC), headed by Dr. Jen Hsin-min, Director of the China Space Technology Research Institute, Nov. 28 through Dec. 20. The purpose of the visit was to discuss the possible sale by U.S. industry and launch by NASA of a domestic communications satellite and possible cooperation in the Landsat program. After discussions in Washington, NASA representatives accompanied the Chinese delegation on a series of visits to NASA Centers and U.S. aerospace industries.

1978 LAUNCHES

Launch Date	Payload Designation	Launch Vehicle	Launch Site	Mission Remarks
Jan. 6	Intelsat IV-A(F3)	Atlas Centaur	Cape Canaveral	Communications satellite for COMSAT Corp.
Jan. 26	IUE-A	Delta	Cape Canaveral	International Ultraviolet Explorer; space science.
Feb. 9	FLTSATCOM-A	Atlas Centaur	Cape Canaveral	Fleet Satellite Communications for Navy/Air Force.
March 5	Landsat-C	Delta	Vandenberg AFB, Calif.	Earth resources data satellite.
March 31	Intelsat IV-A(F6)	Atlas Centaur	Cape Canaveral	Communications satellite for COMSAT Corp.
April 7	Japan/BSE	Delta	Cape Canaveral	Experimental broadcasting satellite for Japan.
April 26	HCMM	Scout	Vandenberg AFB, Calif.	Heat Capacity Mapping Mission to thermally map the atmosphere.
May 11	OTS-BU	Delta	Cape Canaveral	Orbital Test Satellite for European Space Agency.
May 20	Pioneer Venus 1	Atlas Centaur	Cape Canaveral	Exploration of Venus and studies of solar wind.
June 16	GOES-C	Delta	Cape Canaveral	Geostationary Environmental Satellite for Earth imaging.
June 26	Seasat-A	Atlas-F	Vandenberg AFB, Calif.	Satellite for global ocean monitoring.

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Launch Date	Payload Designation	Launch Vehicle	Launch Site	Mission Remarks
June 29	Comstar-C	Atlas Centaur	Cape Canaveral	Communications satellite for COMSAT Corp.
July 14	ESA/GEOS-B	Delta	Cape Canaveral	Satellite to study atmospheric radiation particles for European Space Agency.
August 8	Pioneer Venus 2	Atlas Centaur	Cape Canaveral	Multiprobe mission to study Venusian atmosphere.
August 12	ISEE-C	Delta	Cape Canaveral	International Sun Earth Explorer; space science.
Oct. 13	TIROS-N	Atlas-F	Vandenberg AFB, Calif.	Operational weather satellite.
Oct. 24	Nimbus-G	Delta	Vandenberg AFB, Calif.	Weather and oceanographic satellite.
Nov. 13	HEAO-B	Atlas Centaur	Cape Canaveral	High Energy Astronomical Observatory; space science.
Nov. 18	NATO-III-C	Delta	Cape Canaveral	Communications satellite for NATO.
Dec. 15	Telesat-D	Delta	Cape Canaveral	Communications satellite for Canada.

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